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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2002P13088WO	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/DE2003/002660	International filing date (day/month/year) 07 August 2003 (07.08.2003)	Priority date (day/month/year) 14 August 2002 (14.08.2002)
International Patent Classification (IPC) or national classification and IPC G01R19/00		
Applicant SIEMENS AKTIENGESELLSCHAFT		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of <u>7</u> sheets, including this cover sheet.  <input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of _____ sheets.
3. This report contains indications relating to the following items:  I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand 11 March 2004 (11.03.2004)	Date of completion of this report 25 October 2004 (25.10.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/DE2003/002660

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☐ the international application as originally filed
- ☒ the description:  
pages \_\_\_\_\_ 1-8 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the claims:  
pages \_\_\_\_\_ 1-15 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, as amended (together with any statement under Article 19  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☒ the drawings:  
pages \_\_\_\_\_ 1/5-5/5 \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
pages \_\_\_\_\_, as originally filed  
pages \_\_\_\_\_, filed with the demand  
pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/DE 03/02660

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Claims	1-15	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-15	NO
Industrial applicability (IA)	Claims	1-15	YES
	Claims		NO

### 2. Citations and explanations

#### 1. Reference is made to the following documents:

D1: US-A-3522515 (Robert H. Harner) 04.08.1970

D2: US-A-6028426 (R. F. Cameron, H. MacCallum)  
22.02.2000

D3: FR-A-2541777 (Saft S. A.) 31.08.1984

D4: US-A-3289078 (A. G. Ratz) 29.11.1966.

#### 2. Novelty

##### 2.1 Claim 1:

2.1.1 Document D1, considered to be the closest prior art, discloses a method for measuring current at a potential greater than zero (figure 1, (10), 138-750 kV), the current value being measured as an analogue signal and the information thus derived being transmitted, after voltage-frequency conversion, as a pulse signal to an evaluation unit at earth potential (column 1, lines 39-43), the analogue signal being compressed prior to the voltage-frequency conversion and transmission, and the digital signal being expanded after transmission

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at earth potential (column 3, line 66 to column 4, line 6: "logarithmic function...to increase the effective range").

2.1.2 The subject matter of claim 1 differs from the aforementioned document in that an A/D conversion is carried out and a digital signal is transmitted.

2.1.3 Thus, the subject matter of claim 1 is novel and satisfies the requirements of PCT Article 33(2).

2.2 Claim 7:

2.2.1 Document D1, considered to be the closest prior art, also discloses a circuit arrangement for implementing the method according to claim 1 for the purpose of measuring current at a shunt, the voltage drop being evaluated as a measure of the current after amplification, said circuit arrangement comprising a shunt (figure 1, (20)), an amplifier (figure 3, (31); a transistor and wiring arrangement in (83)) for the voltage signal measured at the shunt (20), a voltage-frequency converter (figure 3, (83)) and an evaluation unit (figure 1, (42-52)), and means for supplying current to the measurement components (figure 1, (36)), further means (column 3, line 66 to column 4, line 6, "logarithmic function...to increase the effective range") being available for signal compression and for signal expansion.

2.2.2 The subject matter of claim 7 differs from document D1 in that an A/D converter is present.

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2.2.3 Thus, the subject matter of claim 7 is novel and satisfies the requirements of PCT Article 33(2).

2.3 Claims 2-6 and 8-15 are dependent claims and therefore satisfy the requirements of PCT Article 33(2).

### 3. Inventive step

#### 3.1 Claim 1:

3.1.1 The effect of a digital conversion is that the digital signal generated supplies the clock pulse for modulating the transmitted signal.

3.1.2 The problem addressed by the present invention can thus be regarded as that of devising a voltage-frequency conversion for generating the transmitted-signal clock pulse.

3.1.3 It is common knowledge to a person skilled in the art that the feature of an A/D converter for generating a frequency proportional to the voltage is equivalent to, and if required can be interchanged with, the feature of a voltage-frequency converter known from D1 (see column 3, line 66 to column 4, line 6).

3.1.4 Thus, the subject matter of claim 1 does not involve an inventive step and therefore fails to meet the requirement of PCT Article 33(3).

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## 3.2 Claim 7:

3.2.1 Since, by analogy, the deficient feature in claim 7 corresponds to the inadequate feature of claim 1, the objections to claim 1 apply, by analogy, to claim 7.

3.2.2 In consequence, the subject matter of claim 7 does not involve an inventive step and, therefore, fails to meet the requirement of PCT Article 33(3).

3.3 Dependent claims 2-6 and 8-15 contain no features which, in combination with the features of any claim to which they refer back, meet the PCT requirements for inventive step. The additional features can, in each case, be derived from another document:

## 3.3.1 claim 2:

- logarithmic compression and expansion (D1, column 3, line 66 to column 4, line 6: "logarithmic function...to increase the effective range");

## 3.3.2 claim 3:

- root function (D4, column 2, lines 7-42);

## 3.3.3 claims 4 and 8:

- temperature-dependent compensation (D2, column 1, lines 39-53).

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## 3.3.4 claim 5:

- thermal coupling (D2, column 1, lines 39-53: "temperature sensor sensing the temperature of the shunt", figure 2 (50));

## 3.3.5 claim 6:

- transmission of the compressed signal (D1, column 3, line 66 to column 4, line 6: "logarithmic function...to increase the effective range");
- A/D conversion provides the clock pulse for the transmitted signal (D1, voltage-frequency conversion);
- supply current modulation (D3, page 10, claim 1, lines 9-13);

## 3.3.6 claim 9:

- signal compression before A/D conversion (D1, see column 3, line 66 to column 4, line 6: "logarithmic function...to increase the effective range");

## 3.3.7 claim 10:

- microcontroller for signal expansion (routine in the art);

## 3.3.8 claim 11:

temperature-dependent reference voltage source (D2, (50));

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## 3.3.9 claim 12:

- means for short-circuiting or overcurrent tripping (D1, figure 1, (11));

## 3.3.10 claim 13:

- comparator with an overload tripping threshold (D3, figure 2, (13, 14) and page 4, line 22 to page 7, line 29; this is an obvious solution for a person skilled in the art);

## 3.3.11 claim 14:

- comparator with a temperature threshold (in the presence of temperature-averaging as per document D2 (column 1, lines 46-47), this solution is obvious for a person skilled in the art);

## 3.3.12 claim 15:

- thermal model (D2, column 1, lines 46-47).

3.3.13 In consequence, the subject matter of claims 2-6 and 8-15 does not involve an inventive step and therefore fails to meet the requirements of PCT Article 33(3).

#### 4. Industrial applicability

Claims 1-15 satisfy the requirements of PCT Article 33(4).